<u>WE CLAIM:</u>

1   1. A frequency analyzer for analyzing a plurality of input signals

2    $x_0(m)...x_r(m)...x_{M-1}(m)$, the frequency analyzer comprising:

3   a plurality of input modulators for modulating said input signals $x_0(m)...x_r(m)...$

4    $x_{M-1}(m)$, defining shifted output signals.

5   a polyphase filter network which includes a plurality of polyphase filters

6    $p_0(m)...p_p(m)...p_{M-1}(m)$ for receiving said shifted output signals and defining polyphase filter

7   output signals; and

8   a plurality of output modulators for modulating the output of said polyphase filters.

1   2.   The frequency synthesizer as recited in claim 1, wherein said input modulators

2   includes means for multiplying said input signals $x_0(m)...x_r(m)...x_{M-1}(m)$ by a factor $e^{-j2\pi k_o m}$,

3   where k_0 is a selectable odd/even stacking factor.

1   3.   The frequency synthesizer as recited in claim 1, wherein said output modulator

2   includes means for multiplying said polyphase filter output signals by a factor $e^{-j2\pi kop/M}$, where

3   k_0 is a suitable odd/even stacking factor and p is the channel, and M is total number of

4   channels.

1   4. A polyphase filter comprising:

2   a plurality of filter channels,

3    $$\overline{p_0}(m)...\overline{p_p}(m)...\overline{p_{M-1}}(m)$$

4   for filtering a plurality of input signals $x_0(m)...x_p(m)..x_{M-1}(m)$

5   a complex modulator, which modulates each input signal $x_0(m)...x_p(m)...x_{M-1}(m)$ by

6   a factor $(-1)^m$, where m is the time index; and

7   a plurality of output modulators for modulating each of the outputs of said plurality

8   filter channels by a modulation factor.

1   5. The polyphase filter as recited in claim 4, wherein said complex modulation

2   factor is $e^{-j2\pi kop/M}$, where k_0 is a selectable odd/even stacking factor, p is the channel and M is the

3 number of channels.

1   6. A complex modulator for generating a signal $(-1)^m$, where m is a time index, the

2 modulator comprising:

3   a multiplexer adapted to receive an input signal IN at one input and an inverted

4 input at another input;

5   an AND gate having at least two inputs and an output, said output for controlling

6 said multiplexer; and

7   a divider for dividing a clock signal by two defining a divided signal, said divided

8 signal applied to one input of said AND gate;

9   wherein said AND gate is adapted to receive an odd/even stacking factor k_o at the

10 other of said inputs of said AND gate.

1   7. The frequency analyzer as recited in claim 1, wherein said input modulators

2 include an inverter and a one more multiplexers for receiving one or more compensation

3 vectors for selectively negating said input signals.

1   8. A frequency synthesizer for synthesizing a plurality of input signals

2 $x_0(m)...x_r(m)...x_{M-1}(m)$, the frequency synthesizer comprising:

3   a plurality of input modulators for modulating said input signals

4 $x_0(m)...x_r(m)...x_{M-1}(m)$, defining shifted output signals.

5   a polyphase filter network which includes a plurality of polyphase filters

6 $p_0(m)...p_\rho(m)...p_{M-1}(m)$ for receiving said shifted output signals and defining polyphase filter

7 output signals; and

8   a plurality of output modulators for modulating the output of said polyphase filters.

1   9. The frequency synthesizer as recited in claim 8, wherein said input modulators

2 include an inverter and a one more multiplexers for receiving one or more compensation

3 vectors for selectively negating said input signals.